

**CLAIMS**

1. A process for preparing an alkylaromatic hydrocarbon composition comprising contacting a feedstock comprising an olefinic hydrocarbon mixture and an aromatic compound under alkylation conditions with an aromatic alkylation catalyst selected from a homogeneous acid catalyst and heterogeneous acid catalyst comprising a molecular sieve having an X-ray diffraction pattern including d-spacing maxima at  $12.4 \pm 0.25$ ,  $6.9 \pm 0.15$ ,  $3.57 \pm 0.07$  and  $3.42 \pm 0.07$  Angstroms, said olefinic hydrocarbon mixture comprising at least 5% by weight of mono-olefin oligomers of the empirical formula:



wherein n is greater than or equal to 10, wherein said mono-olefin oligomers comprise at least 20% by weight of olefins having at least 12 carbon atoms and said olefins having at least 12 carbon atoms have an average of from 0.8 to 2.0 C<sub>1</sub>-C<sub>3</sub> alkyl branches per carbon chain.

2. The process of claim 1 wherein said olefins having at least 12 carbon atoms have an average of from 0.8 to 1.3 C<sub>1</sub>-C<sub>3</sub> alkyl branches per carbon chain.

3. The process of claim 1 or claim 2 wherein said olefins having at least 12 carbon atoms contain no branches other than C<sub>1</sub>-C<sub>3</sub> alkyl groups.

4. The process of any preceding claim wherein said olefinic hydrocarbon mixture comprises at least 20% by weight of said mono-olefin oligomers.

5. The process of any preceding claim wherein said olefinic hydrocarbon mixture comprises at least 80% by weight of said mono-olefin oligomers.

6. The process of any preceding claim wherein said mono-olefin oligomers comprise from about 50% to about 98% by weight of olefins having less than or equal to 12 carbon atoms and from about 2% to about 50% by weight of olefins having more than 12 carbon atoms.

7. The process of any preceding claim wherein said mono-olefin oligomers comprise from about 50% to about 70% by weight of olefins having less than or equal to 12 carbon atoms and from about 30% to about 50% by weight of olefins having more than 12 carbon atoms.

8. The process of any preceding claim wherein said mono-olefin oligomers comprise from about 55% to about 65% by weight of olefins having about 12 carbon atoms and from about 35% to about 45% by weight of olefins having about 16 carbon atoms.

9. The process of any preceding claim wherein said mono-olefin oligomers are produced by oligomerizing an olefin selected from propene, butene and mixtures thereof over surface-deactivated ZSM-23.

10. The process of any preceding claim wherein said olefinic hydrocarbon mixture also contains linear alpha-olefins containing at least 10 carbon atoms.

11. The process of any preceding claim wherein said feedstock also comprises up to 80wt% of paraffins.

12. The process of any preceding claim wherein said aromatic alkylation catalyst is a heterogeneous acid catalyst comprising a said molecular sieve having an X-ray diffraction pattern including d-spacing maxima at  $12.4 \pm 0.25$ ,  $6.9 \pm 0.15$ ,  $3.57 \pm 0.07$  and  $3.42 \pm 0.07$  Angstrom

13. The process of claim 12 wherein said molecular sieve is selected from MCM-22, PSH-3, SSZ-25, ERB-1, ITQ-1, ITQ-2, MCM-36, MCM-49 and MCM-56.

14. The process of claim 12 wherein said molecular sieve is MCM-22.

15. The process of any one of claims 12 to 14 wherein said alkylation conditions include a temperature of from 100°C to about 350°C, a pressure of about 1 to about 25 atmospheres, a WHSV of about 0.5 hr<sup>-1</sup> to about 100 hr<sup>-1</sup> and an aromatic compound to olefinic hydrocarbon mixture mole ratio of about 1:1 to about 20:1.

16. The process of any one of claims 1 to 11 wherein said aromatic alkylation catalyst is a homogeneous acid catalyst.

17. The process of claim 16 wherein said homogeneous acid catalyst comprises a Lewis acid catalyst.

18. The process of claim 17 wherein said homogeneous acid catalyst is aluminum chloride.

19. The process of claim 16 wherein said homogeneous acid catalyst comprises a Brønsted acid catalyst.

20. The process of claim 19 wherein said homogeneous acid catalyst is HF or phosphoric acid.

21. The process of any one of claims 16 to 20 wherein said alkylation conditions include a temperature of from about  $-10^{\circ}\text{C}$  to about  $50^{\circ}\text{C}$ , a pressure of from about 1.0 to about 5.0 atmospheres, a feed weight hourly space velocity (WHSV) of from about  $0.2\text{hr}^{-1}$  to about  $10\text{hr}^{-1}$  and an aromatic compound to olefinic hydrocarbon mixture mole ratio of from about 1:1 to about 15:1.

22. The process of any preceding claim wherein said aromatic compound is selected from the group consisting of benzene and toluene.

23. An alkylaromatic hydrocarbon composition produced by the process of any preceding claim.

24. An alkylaromatic hydrocarbon mixture comprising a plurality of alkylaromatic hydrocarbons each having:

- (a) at least 12 carbon atoms in its alkyl side chain,
- (b) an average of from 0.8 to 2.0  $\text{C}_1\text{-C}_3$  alkyl branches per alkyl side chain and no branches in said alkyl side chain other than  $\text{C}_1\text{-C}_3$  alkyl,
- (c) an average of less than 0.1 quaternary carbon atoms in said alkyl side chain and
- (d) at least 95% of the aromatic species being located at the 2- or 3-position in the alkyl side chain.

25. The alkylaromatic hydrocarbon mixture of claim 24 wherein the aromatic moiety is selected from phenyl and tolyl.

26. A process for making an alkylaryl sulfonate mixture comprising sulfonating the alkylaromatic hydrocarbon composition of claim 23.

27. A process for making an alkylaryl sulfonate mixture comprising sulfonating the alkylaromatic hydrocarbon mixture of claim 24 or claim 25.

28. A process for preparing an alkylaryl sulfonate mixture comprising the steps of:

(a) contacting a first feedstock comprising a first olefinic hydrocarbon mixture and an aromatic compound under alkylation conditions with an aromatic alkylation catalyst to produce a first alkylaromatic hydrocarbon composition, said first olefinic hydrocarbon mixture comprising at least 5% by weight of mono-olefin oligomers having the empirical formula:



wherein n is greater than or equal to 10 and less than or equal to 12 and having an average of from 0.8 to 2.0 C<sub>1</sub>-C<sub>3</sub> alkyl branches per carbon chain;

(b) contacting a second feedstock comprising a second olefinic hydrocarbon mixture and an aromatic compound under alkylation conditions with an aromatic alkylation catalyst to produce a second alkylaromatic hydrocarbon composition, said second olefinic hydrocarbon mixture comprising at least 5% by weight of mono-olefin oligomers having the empirical formula:



wherein n is greater than 12 and having an average of from 0.8 to 2.0 C<sub>1</sub>-C<sub>3</sub> alkyl branches per carbon chain;

(c) forming a mixture comprising about 50% to about 98% by weight of said first alkylaromatic hydrocarbon composition and about 2% to about 50% by weight of said second alkylaromatic hydrocarbon composition; and  
(d) sulfonating the mixture produced in step (c).

29. An alkylaryl sulfonate mixture produced by the process of any one of claims 26 to 28.

30. An alkylarylsulfonate mixture comprising a plurality of alkylarylsulfonate compounds each having:

- (a) at least 12 carbon atoms in its alkyl side chain,
- (b) an average of from 0.8 to 2.0 C<sub>1</sub>-C<sub>3</sub> alkyl branches per alkyl side chain and no branches in said alkyl side chain other than C<sub>1</sub>-C<sub>3</sub> alkyl,
- (c) an average of less than 0.1 quaternary carbon atoms in said alkyl side chain,
- (d) at least 95% of the aromatic species being located at the 2- or 3-position in the alkyl side chain,
- (h) a Krafft temperature below 10°C and
- (f) a hard water insolubility of less than 1 wt%.

31. The alkylarylsulfonate mixture of claim 30 wherein the aromatic moiety is selected from phenyl and tolyl.